

## FLORISTICS OF A XERIC SANDYLAND IN WESTERN LOUISIANA

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### ABSTRACT

The floristics and edaphic conditions of a western Louisiana xeric sandhill woodland are described. This community, which occurs in central and northwestern Louisiana, is rare. The soil is nutrient poor and porous. Water and air move rapidly through it causing rapid drying. In presettlement times, sandylands were probably fairly common in the West Gulf Coastal Plain, but because of fire suppression, grazing, agriculture, and agroforestry, this community is now rapidly vanishing.

KEY WORDS: Sandy woodlands, xeric, Kisatchie National Forest, floristics, Louisiana

### INTRODUCTION

Like so many plant communities of the West Gulf Coastal Plain, there is little published information on xeric sandylands (Ajilvsgi 1979; Watson 1979; Marietta 1979; Christensen 1988; Orzell 1990; Martin & Smith 1991; Stout & Marion 1993). In western Louisiana, xeric sandylands have been classified into two types by the Louisiana Natural Heritage Program: xeric sandhill woodland and stream terrace sandy woodland. These communities occur in east Texas (Marietta 1979; Ward 1984; Bridges & Orzell 1989; Marks & Harcombe 1981; Harcombe *et al.* in press), in central and northwestern Louisiana, and in southern Arkansas. The sandyland communities of the West Gulf Coastal Plain appear to be similar in tree species composition and structure to turkey oak sandhill forests in the East Gulf Coastal Plain except for the absence of several key species such as turkey oak (*Quercus laevis* Walt.) and wiregrass (*Aristida stricta* Michx.) (Christensen 1988; Stout & Marion 1993; Harcombe *et al.* in press) and the presence of several western elements.

Sandylands occur mainly in Tertiary marine deposits on ridge tops and upper slopes, and on Pleistocene deposits on terraces near streams. The deep

sandy soils are of low fertility and, because of their porous nature, water and air move rapidly through them causing rapid drying. Overstory, midstory, and herbaceous vegetation are often sparse, allowing sun to reach the ground, and in some areas, trees are virtually absent. Reflected glare from the white sand is often intense. Trees, typically a combination of overstory pines and midstory oaks (especially *Quercus incana* Bartr.), are often stunted. Lichens and mosses are usually plentiful on the bare soils.

The unusualness of sandylands is reflected in the fact that 10 percent of the plants listed as rare by the Louisiana Natural Heritage Program, and 20 percent of the species listed as sensitive by the Kisatchie National Forest are fidel to this community.

We made a study of the vascular flora of one xeric sandhill woodland in the Winn Ranger District of the Kisatchie National Forest. The site is located in Natchitoches Parish (T13N R6W Sec. 7) (Caldwell 1991).

## METHODS

We visited one sandyland — Susan's Sandyland — every two to three weeks between the summer of 1993 and the autumn of 1994. During these visits, we collected and recorded all vascular plants found. We follow MacRoberts (1984, 1989), Gandhi & Thomas (1989), and Allen (1992) in most instances of botanical nomenclature. Voucher specimens of many of the species collected are deposited at Vanderbilt (VDB), the Range Management Research Herbarium, Southern Forest Experiment Station, United States Forest Service (SFRP), Northeast Louisiana University (NLU), and Louisiana State University (LSU).

The study area was a partly open (30% cover) 0.75 ha plot surrounded by a sandy woodland community (75% cover) dominated by *Quercus incana*, *Q. marilandica* Muenchh., *Q. stellata* Wang., *Carya* sp., and *Pinus taeda* L. Susan's Sandyland is about 90 meters above sea level.

While the specific fire history of this area is uncertain, it has not burned in years. In presettlement times before fire suppression became a normal practice, the site probably burned regularly since sandylands are embedded in the pyrogenic longleaf pine community, which probably burned every 1 to 3 years (Smith 1991).

We also made irregular observations of other sandyland sites in central and northwestern Louisiana and in east Texas.

Climatic data are given in Martin *et al.* (1990). Annual precipitation averages about 125 cm and is fairly evenly distributed throughout the year. In summer, temperatures rise to 35° C, which, combined with short droughts, translates into very hot and dry conditions. Under these conditions, especially when there are short droughts, the exposed sands become very dry.

Soil samples were taken from the upper 15 cm of Susan's Sandyland and at two other sandy woodlands in the Winn District, and were analyzed by A & L Laboratories, Memphis, Tennessee.

## RESULTS

We list the vascular plants found at Susan's Sandylands in Table 1. Fruticose lichens, such as *Cladonia*, are important in this community but they have yet to be studied.

We list the soil characteristics of Susan's Sandyland and two other sandylands in the Winn District in Table 2. Two sites are upland sandhill woodlands and one is a stream terrace woodland.

The soil on which this community occurs - whether on hill tops or stream terraces - is acidic loamy fine sand of low fertility and rapid permeability (Martin *et al.* 1990).

## DISCUSSION

We recorded a total of 61 taxa, representing 56 genera and 34 families for Susan's Sandyland. There appeared to be no dominant families. Sandylands have fewer species than a number of other plant communities in the Kisatchie National Forest, for example, bogs, sandstone outcrops, and prairies, which for comparable area would have had nearly twice the number of species (MacRoberts & MacRoberts 1993a, b; Smith *et al.* 1989). In fact, sandyland communities are rather austere: they rarely have continuous ground cover and always have large open patches of exposed sand (*e.g.*, see quantified information in Ward 1984:53).

Logan (1994) mentions xeric sandylands as occurring in south central Arkansas. Marks & Harcombe (1981), Harcombe *et al.* (*in press*), and Ward (1984) studied the woody vegetation, and Marietta (1979) studied both woody and herbaceous vegetation of xeric longleaf pine communities in east Texas. The latter two describe communities similar to, but slightly more mesic, than our study site. Matos & Rudolph (1985) surveyed the vegetation of the Roy E. Larson Sandylands Sanctuary in the Big Thicket of Texas. Their description is essentially identical to ours. Orzell (1990) briefly describes sandylands in the National Forests of Texas, emphasizing the presence of *Quercus incana*. It is this single species that we have come to recognize as the major indicator of western sandylands: its presence signals deep sands and accompanying xeric conditions.

In our area, roads are generally constructed on ridge tops and consequently it is fairly easy to survey for upland sandylands. From our experience in Natchitoches, Winn, Bienville, and Caddo parishes, it would appear that there

Table 1. Vascular plants at Susan's Sandyland.

- ACANTHACEAE *Ruellia humilis* Nutt.
- AGAVACEAE *Yucca louisianensis* Trel.
- AMARANTHACEAE *Froelichia floridana* (Nutt.) Moq.
- ANACARDIACEAE *Rhus copallina* L., *Toxicodendron radicans* (L.) Kuntz.
- ASCLEPIADACEAE *Asclepias tuberosa* L.
- ASTERACEAE *Conyza canadensis* (L.) Cronq., *Croptilon divaricatum* (Nutt.) Raf., *Gnaphalium obtusifolium* L., *G. purpureum* L., *Heterotheca pilosa* (Nutt.) Shinnery, *Krigia virginica* (L.) Willd., *Liatris elegans* (Walt.) Michx.
- BORAGINACEAE *Lithospermum caroliniense* (J.F. Gmel.) MacM.
- CACTACEAE *Opuntia humifusa* (Raf.) Raf.
- CAMPANULACEAE *Triodanis perfoliata* (L.) Nieuwl.
- CAPPARIDACEAE *Polanisia erosa* (Nutt.) Iltis
- CARYOPHYLLACEAE *Paronychia drummondii* Torrey & A. Gray.
- CISTACEAE *Helianthemum georgianum* Chapm.
- CLUSIACEAE *Hypericum gentianoides* (L.) B.S.P., *H. hypericoides* (L.) Crantz.
- COMMELINACEAE *Commelina erecta* L., *Tradescantia reverchonii* Bush.
- CONVOLVULACEAE *Stylisma villosa* (Nash) House.
- CORNACEAE *Cornus florida* L.
- CYPERACEAE *Bulbostylis ciliatifolia* (Ell.) Fern., *Carex tenax* Chapm., *Cyperus grayioides* Mohlenbrock, *Cyperus retrofractus* (L.) Torrey, *Rhynchospora grayi* Kunth, *Scleria triglomerata* Michx.
- ERICACEAE *Vaccinium arboreum* Marsh.
- EUPHORBIACEAE *Chamaesyce cordifolia* (Ell.) Small, *Cnidiosculus stimulosus* (Michx.) Engelm. & A. Gray, *Crotonopsis elliptica* Willd.

Table 1 (continued).

- FABACEAE *Astragalus leptocarpus* Torrey & A. Gray, *Centrosema virginianum* (L.) Benth., *Lespedeza virginica* (L.) Britt., *Tephrosia virginiana* (L.) Pers.
- FAGACEAE *Quercus incana* Bartr., *Q. marilandica* Muenchh., *Q. stellata* Wang.
- JUGLANDACEAE *Carya* sp.
- LAMIACEAE *Monarda punctata* L., *Trichostema dichotomum* L.
- LAURACEAE *Sassafras albidum* (Nutt.) Nees.
- LOGANIACEAE *Gelsemium sempervirens* (L.) St. Hil., *Polypremum procumbens* L.
- PINACEAE *Pinus taeda* L.
- POACEAE *Aristida desmantha* Trin. & Rupr., *A. lanosa* Muhl. ex Ell., *Dichantheium sphaerocarpon* (Ell.) Gouid, *Paspalum* spp., *Schizachyrium tenerum* Nees.
- POLYGONACEAE *Polygonella polygama* (Vent.) Engelm. & A. Gray.
- RUBIACEAE *Diodia teres* Walt.
- SAPOTACEAE *Bumelia lanuginosa* (Michx.) Pers.
- SCROPHULARIACEAE *Linaria canadensis* (L.) Dum.-Cours.
- SELAGINELLACEAE *Selaginella arenicola* Underw. ssp. *riddellii* (Van Eselt.) Tyron.
- VERBENACEAE *Glandularia canadensis* (L.) Nutt., *Stylodon carneus* (Medic.) Moldenke.
- VITACEAE *Vitis mustangensis* Buckl.

Table 2. Soil characteristics of three sandylands in the Winn District.

Sample	pH	Exchangeable Ions (ppm)				OM%
		P	K	Ca	Mg	
Susan's Sandyland (upland)						
Sample 1.	5.7	12	20	500	30	3.5
Sample 2.	5.1	9	22	210	18	3.7
Sample 3.	5.4	12	25	150	21	1.3
Goldonna Sandyland (stream terrace)						
Sample 1.	5.8	7	26	240	35	1.6
Sample 2.	5.4	7	24	240	50	2.4
Opuntia Sandyland (upland)						
Sample 1.	5.4	6	28	230	17	2.3

has been concerted effort to convert sandylands to either low quality melon farms or to pine plantations. Time and again we have encountered stands of shrub-sized *Quercus incana* sprouting from cut trees interspersed with recently planted pines.

In Louisiana and Texas, xeric sandylands are rare "and [are] becoming scarcer with forest type conversion" (Martin & Smith 1991:99). Estimates for presettlement acreage, based on plant distribution relative to surface geology, are 50,000 to 100,000 acres. Today, only between 10% and 25% remain (Latimore Smith, pers. comm.) and undisturbed or minimally disturbed examples are exceedingly rare. The vast majority have been converted to low productivity watermelon fields and tree farms, and this trend is continuing.

#### RARE SPECIES

A number of plants rare to Louisiana and to the Kisatchie National Forest are fidel or nearly so to sandylands. The following is a brief account of those species known from the Kisatchie National Forest currently on the Forest "ETS" (endangered, threatened, sensitive) list and on the Louisiana Natural Heritage rare plant or watch lists. Parish locations outside the National Forest are also given. Additional information on these species with site locations is on file with the Kisatchie National Forest and with the Louisiana Natural Heritage Program.

*Carex tenax* Chapm. (*MacRoberts & MacRoberts* 2282 [VDB], 2295, 2296, 2339 [SFRP], 2294, 2333 [NLU], 2334 [LSU]). Strong sedge, a southeastern

species, has been found at eighteen upland sandyland sites in the Kisatchie District, Natchitoches Parish, and three in the Winn District, Natchitoches Parish. It also occurs in Vernon Parish.

*Cyperus grayioides* Mohlenbrock. (*MacRoberts & MacRoberts 1801, 2072* [VDB], *2071, 1798* [SFRP], *2070* [NLU], *1803* [LSU]). Mohlenbrock's umbrella sedge, first reported from the West Gulf Coastal Plain in the early 1970's, has now been collected many times in eastern Texas and western Louisiana, and more recently in Arkansas (Logan 1994). There are seven sites for it on the Kisatchie District, Natchitoches Parish, and four sites on the Winn District, in Winn and Natchitoches parishes. Other parishes in the state where it is found are Allen, Bienville, and Vernon.

*Eriogonum longifolium* Nutt. (*MacRoberts & MacRoberts 1800* [VDB], *1797* [SFRP]). Long-leaved wild buckwheat, a Great Plains species, in the West Gulf Coastal Plain is a sandylands plant favoring oak/pine woodland edge. It is known from one stream terrace sandyland in an inholding on the Winn District, Winn Parish. It is also known from Caddo and Vernon parishes.

*Eriogonum multiflorum* Benth. (*MacRoberts & MacRoberts 1808* [VDB], *1850, 2084* [SFRP], *1820* [NLU]). Many-flowered wild buckwheat, a western species, has been located at five sites on the Winn District, Winn and Natchitoches parishes, and five sites on the Kisatchie District, Natchitoches Parish. It also is found in Bienville, Caddo, and Webster parishes.

*Paronychia drummondii* Torrey & A. Gray. (*MacRoberts & MacRoberts 2083* [VDB], *2344, 2281* [SFRP], *1805* [LSU]). Drummord's nailwort, a Texas near-endemic that reaches its geographical limit in western Louisiana, is known from eight locations on the Winn District, Natchitoches and Winn parishes. It also occurs in Bienville and Caddo parishes.

*Penstemon murrayanus* Hook. (*MacRoberts & MacRoberts 1612* [VDB], *Grelen 2052* [SFRP]). Cupleaf beardtongue, a species found in Arkansas, Oklahoma, Texas, and western Louisiana, is known from only one stream terrace sandyland on an inholding in the Winn District, Winn Parish. It is also found in Caddo Parish.

*Phacelia strictiflora* (Engelm. & A. Gray) A. Gray. (*MacRoberts & MacRoberts 2211* [VDB], *Thomas & Kessler 75762* [NLU]). Phacelia, a species of the southcentral U.S., is known from two stream terrace sandylands on the Winn District, Winn Parish. It has also been reported from Natchitoches and Bienville parishes.

*Polanisia erosa* (Nutt.) Iltis. (*MacRoberts & MacRoberts 1802* [VDB], *2340, 2341* [SFRP], *2442* [NLU], *1821* [LSU]). Clammy weed, a species apparently confined to Texas, Oklahoma, Arkansas, and western Louisiana, has been found at four sites in the Kisatchie District, Natchitoches Parish, and three sites on the Winn District, Winn and Natchitoches parishes. It also occurs in Bienville and Sabine parishes and is known historically from Rapides Parish.

*Polygonella americana* (Fisch. & Meyer) Small. (*MacRoberts & MacRoberts* 1799 [VDB], 2428 [SFRP]). Southern jointweed, a species found in sandy woodlands from South Carolina to New Mexico, occurs at a single stream terrace sandyland inholding on the Winn District, Winn Parish. It is also known from Bienville, Sabine, and Caddo parishes.

*Polygonella polygama* (Vent.) Engelm. & A. Gray. (*MacRoberts & MacRoberts* 2128 [VDB], 920, 2147 [SFRP]). Jointweed was first found in Louisiana in 1988 on the Winn District, Natchitoches Parish, where it is abundant in one locality (Johnson & Johnson 1990). This species, which ranges across the southern U.S. to Texas, is not known from any other locality in Louisiana.

*Psoralea subulata* Bush. (*MacRoberts & MacRoberts* 2236 [LSU,VDB, SFRP,NLU]). Awl-shaped scurf-pea occurs in eastern Texas, southern Oklahoma, southwestern Arkansas, and western Louisiana. It was first found on the Kisatchie District, Natchitoches Parish, in a single sandyland in 1994. It is also known from Caddo Parish.

*Selaginella arenicola* Underw. ssp. *riddellii* (Van Eselt.) Tryon. (*MacRoberts & MacRoberts* 1809 [VDB], 1779 [SFRP]). Riddell's spikemoss is a Coastal Plain species that is rare in the West Gulf Coastal Plain. Since the middle of the last century, it has been known from areas that are now probably part of the Kisatchie National Forest. On the Kisatchie District, it is known from nine sites, most of which are sandstone outcrop communities (*MacRoberts & MacRoberts* 1993b). On the Winn District, Natchitoches and Winn parishes, it is known from three sandylands. It is also known from Bienville, Sabine, Caddo, and Vernon parishes.

*Streptanthus hyacinthoides* Hook. (*MacRoberts & MacRoberts* 2298 [VDB], 2392, 2347 [SFRP]). Smooth twistflower, an endemic to Arkansas, Texas, Oklahoma, and western Louisiana, has been found at two sandylands on the Winn District, Winn Parish, and one sandyland on the Kisatchie District, Natchitoches Parish. It also occurs in Bienville and Caddo parishes.

*Tetragonotheca ludoviciana* (Torrey & A. Gray) A. Gray. (*MacRoberts & MacRoberts* 1988 [VDB], 1691 [SFRP]). Louisiana square-head, a widely distributed West Gulf Coastal Plain endemic, was not reported from the Kisatchie National Forest until 1992. There are now six known locations on the Kisatchie District, Natchitoches Parish, and one on the Vernon District, Vernon Parish (Hart & Lester 1993). This species is also found in Allen, Caddo, and Sabine parishes.

*Tradescantia reverchonii* Bush. (*MacRoberts & MacRoberts* 1565 [VDB] 2276, 2407 [SFRP]). This species is found almost exclusively in sandylands of western Louisiana and eastern Texas, south to the Rio Grande Valley. It is common in all sandylands in both the Kisatchie and Winn Districts. It appears to especially like disturbed areas and is also known from Bienville, Beauregard, Caddo, Sabine, and Vernon parishes (*MacRoberts* 1980).

*Zornia bracteata* (Walt.) Gmel. (*MacRoberts & MacRoberts* 1897 [VDB],



1807, 2413 [SFRP]). *Viperina*, a southeastern species that is rare in the West Gulf Coastal Plain, has been found in one stream terrace sandyland inholding on the Winn District, Winn Parish. In western Louisiana, it is also known from Caddo, Natchitoches, and Vernon parishes.

Other rare sandyland species on the Louisiana Natural Heritage list from western Louisiana that are not found on the Kisatchie National Forest are the following (parishes in parentheses): *Astragalus sozmaniorum* Lundell (Caddo, Union), *Coreopsis intermedia* Sherff (Caddo), *Crataegus uniflora* Muenchh. (many north Louisiana parishes), *Croton argyranthemus* Michx. (Caddo, Sabine, Vernon), *Dalea phleoides* (Torrey & A. Gray) Shinnery (Caddo), *Dalea villosa* (Nutt.) Sprengel var. *grisea* (Torrey & A. Gray) Barneby (Caddo), *Draba cuneifolia* Nutt. ex Torrey & A. Gray (Caddo, Winn), *Matelea cynanchoides* (Engelm.) Woods. (Caddo), *Mirabilis albida* (Walt.) Heimerl (Caddo, Natchitoches), *Prunus gracilis* Engelm. & A. Gray (Caddo), *Psoralea digitata* Nutt. ex Torrey & A. Gray (Caddo), *Quercus arkansana* Sarg. (Boissier, Caddo, Union, Webster), *Scutellaria cardiophylla* Engelm. & A. Gray (Caddo, Calcasieu, Vernon), *Silene subciliata* B.L. Robins. (Allen, Sabine, Vernon), *Thelesperma filifolium* (Hook.) A. Gray (Caddo).

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